Highly Active Antiretroviral Therapy Use and HIV Transmission Risk Behaviors Among Individuals Who Are HIV Infected and Were Recently Released From Jail

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We evaluated highly active antiretroviral therapy (HAART) use and risk behaviors among 177 inmates who were HIV infected and were released and reincarcerated in San Francisco, Calif, jails over a 12-month period. During the month preceding reincarceration, HIV transmission risk behaviors were common among respondents, and 59% of those with a history of antiretroviral use were not taking HAART. HAART discontinuation was independently associated with homelessness, marijuana use, injection drug use, and not receiving community medical care. Postrelease interventions for inmates who are HIV infected are needed. (*Am J Public Health.* 2008;98:661–666. doi:10.2105/AJPH.2007.112656)

A quarter of the adults who are HIV infected in the United States pass through correctional facilities annually.[1] Incarceration represents an opportunity to provide critical HIV prevention and health services, including highly active antiretroviral therapy (HAART).[2–6] The structured environment of jail and prison promote high rates of medication adherence,[7–9] leading to favorable virological and immunologic outcomes.[8,10–12] However, 2 recent studies documented rising viral loads and falling CD4 cell counts among prisoners who were released and then reincarcerated.[11,12] These results suggest that ex-offenders may have difficulty transitioning from a situation in which antiretroviral therapy is taken in a structured and often directly observed setting to one in which medications must be self-managed while facing the challenges of community reentry.[12] Homelessness, joblessness, drug use, mental illness, and inconsistent health care among recently released inmates who are HIV infected likely contribute to discontinuation of or low adherence to treatment.[5,11,12]

To our knowledge, no studies to date have directly assessed HAART use and adherence or factors associated with HAART use among recently released inmates. Furthermore, few studies have described the postrelease sexual and drug-related behaviors in this population.[13,14] To better understand antiretroviral use and HIV transmission behaviors of recently released inmates, we studied 177 inmates who were HIV infected and were released and then reincarcerated in the San Francisco, Calif, jail system in a 12-month period.

METHODS

Participants and Recruitment

The San Francisco Department of Public Health's Forensic AIDS Project provides medical care, case management, discharge planning, and community referrals for all inmates who are HIV infected and who were identified through voluntary testing and inmate disclosure. Inmates taking HAART are released with a 7-day medication supply and a 1-month refill prescription. In 2001, a demonstration grant[15–17] enhanced Forensic AIDS Project services by linking inmates who are HIV infected with community case managers before release and providing 5 months of postrelease supportive services.[16,17]

From April 2001 through June 2003, Forensic AIDS Project providers approached all inmates who were HIV infected to determine participation interest. Interested individuals were referred to research associates who confirmed eligibility, obtained written informed consent, and conducted interviews in private rooms. Inmates were eligible if they (1) were at least 18 years old, (2) spoke English or Spanish, and (3) had at least 2 weeks of jail time remaining in their sentence. Those with a planned transfer to another correctional facility or a documented mental health condition requiring community psychiatric placement were ineligible.

Analyses were restricted to 177 inmates who had been released from San Francisco jails at any point during the 12 months prior to the first day of their current incarceration (68% of the study participants).

Measures

The interview assessed sociodemographics, incarceration history, and use of services the month preceding reincarceration. The date participants last visited a community provider for HIV-related medical care was compared with their release date to determine the proportion receiving postrelease care. Participants prioritized the service they thought they would need most when released.

The Center for Epidemiological Studies Depression Scale was used to screen for depression[18] with the standard cutoff score of 16 or higher.[19] Two or more positive responses on the CAGE Questionnaire indicated past or present alcohol dependence.[20,21] Sexual and drug use behaviors the month preceding reincarceration were measured. Serodiscordant unprotected sexual intercourse included any anal or vaginal intercourse with partners of opposite or unknown HIV status when a condom was not used.

Participants were given a pill card with pictures to determine antiretroviral use during the month preceding reincarceration. Antiretroviral use was classified as HAART according to recommendations from the International AIDS Society–USA Panel.[22,23] Participants were also asked how many times a week they missed at least 1 dose or did not take a full dose of medication (dichotomized as never or less than once a week vs once a week or more).

Statistical Methods

Among participants with a history of antiretroviral therapy use (n = 108), we used χ^2 analyses to assess factors associated with lack of HAART use during the month preceding reincarceration. We entered variables

TABLE 1—Characteristics of 177 HIV-Positive Jail Inmates Who Were Released and Reincarcerated in a 12-Month Period: San Francisco, Calif, January 2000 to June 2003

	No. (%) or Median (Range)
Demographics	
Median age, y	39.5 (22–62)
Gender	
Men	145 (82)
Women	20 (11)
Transgender, male-to-female	12 (7)
Race/Ethnicity	
African American	95 (54)
White	58 (33)
Hispanic	18 (10)
Other[a]	6 (3)
Education[b]	
Less than high school or general equivalency diploma	62 (35)
High school or general equivalency diploma	63 (36)
More than high school	51 (29)
Homeless[c] (month preceding reincarceration)	94 (53)
Health insurance[b]	
None	81 (48)
Public	85 (50)
Private	4 (2)
ADAP or Medicaid coverage for HIV medications (month preceding reincarceration)	108 (61)
Median monthly income (month preceding reincarceration),[b,d] $	900 (0–24 000)
Documented AIDS diagnosis	60 (34)
Median jail and prison incarcerations[b]	17 (3–130)
Community service use	
Receipt of HIV medical care[b] (between release and reincarceration)	106 (61)
Case management visit[b] (month preceding reincarceration)	68 (39)
Mental health provider visit (month preceding reincarceration)	31 (18)
Alcohol or drug treatment (month preceding reincarceration)	50 (28)
Anticipated postrelease service needs[b]	
Housing	97 (55)
HIV medical care	22 (13)
Substance abuse treatment	16 (9)
Case management	11 (6)
Other services[e]	29 (17)
Depression and alcohol drug dependence	
Depression: Center for Epidemiological Studies Depression Scale score ≥ 16[b]	137 (78)
Alcohol dependence: CAGE score ≥ 2	75 (42)
Drug use (month preceding reincarceration)	
Crack cocaine (noninjection)	103 (58)
Marijuana (nonprescription)	90 (51)
Methamphetamine (noninjection)	46 (26)
Heroin (noninjection)	22 (12)
Cocaine (noninjection)	14 (8)
Amyl nitrites	8 (5)
Club drugs (MDMA, GHB, ketamine, LSD)	6 (3)

Continued

associated with lack of HAART use in bivariate analyses ($P \leq .05$) into a logistic regression model simultaneously; age, gender, race/ethnicity, and AIDS diagnosis were forced into the model. A correlation matrix of all multivariate parameter estimates detected no serious multicollinearity; deviance and Pearson residuals confirmed good model fit. Analyses were conducted with SAS version 9.0 (SAS Institute Inc, Cary, NC).

RESULTS

Overall, participants were economically disadvantaged, and repeat incarceration was common. More than half of the participants were homeless the month preceding reincarceration, and housing was their most pressing postrelease service need. Community behavioral risk taking included serodiscordant unprotected sexual intercourse (27%–38%) and distributive syringe sharing (17%). Almost two thirds had a history of antiretroviral use (n = 108); however, 59% of this group (n = 64) did not use HAART the month preceding reincarceration. Among HAART users (n = 44), 52% missed medication doses once a week or more (Table 1).

In the multivariate model, lack of HAART use during the month preceding reincarceration was significantly associated with homelessness, marijuana use, injection drug use, and not receiving community medical care (Table 2).

DISCUSSION

Although nearly three fourths of the inmates who are HIV infected in San Francisco jails who need antiretroviral therapy take it,[10] we observed alarmingly low rates of HAART use and adherence among inmates who were released into the community and then reincarcerated. Our results support results of recent studies that documented loss of clinical benefits from HAART postrelease.[11,12] Suboptimal HAART use while in the community compromises the personal health of ex-offenders and may increase HIV transmission,[24–26] including transmission of drug-resistant strains.[27,28] This is particularly troubling given the rates of serodiscordant

TABLE 1—*Continued*

Injection drug use[b]	91 (52)
Receptive syringe sharing[f]	22 (24)
Distributive syringe sharing[b,f]	15 (17)
Sharing other drug equipment[f]	31 (34)
Sexual behaviors	
Men who had sex with men (month preceding reincarceration)	
Serodiscordant/unknown UAI[g]	11 (27)
Men who had sex with women (month preceding reincarceration)	
Serodiscordant/unknown UVI[h]	23 (28)
Women who had sex with men (month preceding reincarceration)	
Serodiscordant/unknown UVI[h]	13 (38)
Male-to-female transgender people who had sex with men (month preceding reincarceration)	
Serodiscordant/unknown UAI[g]	8 (38)
Antiretroviral therapy history	
History of antiretroviral therapy[b]	
Yes	108 (62)
No	65 (38)
HAART use (month preceding reincarceration)[i]	
Yes	44 (41)
No	64 (59)
Missed HAART doses (month preceding reincarceration)[b,j]	
Never or less than once a week	20 (48)
More than once a week	22 (52)

Note. ADAP = AIDS Drug Assistance Program; MDMA = methylenedioxymethamphetamine, GHB = γ-hydroxybutyrate, LSD = lysergic acid diethylamide; UAI = unprotected anal intercourse; UVI = unprotected vaginal intercourse; HAART = highly active antiretroviral therapy.

[a]"Other" included American Indian (4), Asian/Pacific Islander (1), and Creole (1).

[b]Missing data: education (1), health insurance (7), median income (4), median lifetime incarcerations (8), community HIV medical care (3), community case management (2), history of antiretroviral use (4), HAART adherence (2), depression (2), injection drug use (1), distributive syringe sharing (1).

[c]Homeless was defined as having spent at least 1 night on streets, in parks, in abandoned buildings, or in shelters during the month preceding reincarceration.

[d]Combines all illegal and legal sources of income, including benefits (before taxes).

[e]Other services included food assistance, education, job training, financial benefits, mental health care, and family services; each represented less than 5% of the sample.

[f]Among injection drug users (n = 91).

[g]Among men who had sex with men (n = 41) and transgender persons who had sex with men (n = 8).

[h]Among men who had sex with women (n = 81) and women who had sex with men (n = 13).

[i]Among those who ever used antiretroviral therapy (n = 108).

[j]Among those who used HAART the month preceding reincarceration (n = 44).

unprotected sexual intercourse and distributive syringe sharing we observed and others have reported.[14,29–31]

Consistent with studies among the urban poor, we identified several barriers to postrelease HAART use that may be amenable to intervention, including homelessness,[32,33] injection drug use,[34–36] marijuana use,[37] and inconsistent medical care[33,38,39]; however, we did not find an association with depression.[34,40–42] Many ex-offenders have limited access to food, refrigeration, and a safe place to store medications,[43] and the provision of stable housing may be a necessary first step[44] toward sustaining postrelease HAART use. Also, more drug treatment options[11,45–47] are urgently needed, and comprehensive programs that link inmates who are HIV infected to health services,[48–52] support medication adherence,[43] and reduce behavioral risk taking[13,53–55] are essential.

Our study may have overestimated community risk, because the month preceding reincarceration is often unstable and chaotic.[54] Additionally, research has shown that use of self-report to document HIV medication adherence is limited,[56] and temporality could not be established with our cross-sectional design.

Despite these limitations, our results highlight the need for coordinated public health interventions that begin during incarceration and continue postrelease. Such interventions are critical to improving health outcomes for inmates who are HIV infected and preventing further HIV transmission in the community. ■

About the Authors

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Contributors

K. Clements-Nolle designed the research study, conducted the data analysis, and drafted the brief. R. Marx contributed to study design and assisted with writing and revising the brief. M. Pendo directed the study and assisted with writing early drafts of the brief. E. Loughran coordinated field aspects of the study, conducted chart reviews for analysis, and contributed to revisions of the brief. M. Estes coordinated participant recruitment and contributed to revisions of the brief. M. Katz provided guidance on study design and data analysis and assisted with writing and revising the brief.

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TABLE 2—Factors Associated With Lack of Highly Active Antiretroviral Therapy (HAART) Use the Month Preceding Reincarceration in Jail: San Francisco, Calif, January 2000 to June 2003

	No HAART Use (n = 64),[a] No. (%)	HAART Use (n = 44),[a] No. (%)	AOR (95% CI) (n = 106)[b]
Age			
≤Median (39.5 y)	34 (53)	19 (43)	0.59 (0.22, 1.53)
>Median	30 (47)	25 (57)	Reference
Gender			
Men	48 (75)	36 (82)	0.39 (0.12, 1.26)
Women or transgender	16 (25)	8 (18)	Reference
Race			
African American	31 (48)	27 (61)	1.15 (0.43, 3.09)
Other	33 (52)	17 (39)	Reference
Education			
Less than a high school or general equivalency diploma	28 (44)	13 (30)	. . .
High school or general equivalency diploma	36 (56)	30 (70)	
Homeless			
Yes	38 (59)	16 (36)*	2.71 (1.04, 7.08)*
No	26 (41)	28 (64)	Reference
Monthly income			
≤Median ($900)	31 (48)	26 (62)	. . .
>Median	33 (52)	16 (38)	
AIDS diagnosis			
Yes	32 (50)	21 (48)	1.78 (0.67, 4.75)
No	32 (50)	23 (52)	Reference
No. of times previously incarcerated			
≤Median (17 times)	27 (43)	18 (45)	. . .
>Median	36 (57)	22 (55)	
Received postrelease HIV medical care			
Yes	36 (57)	35 (81)	Reference
No	27 (43)	8 (19)**	3.08 (1.05, 9.05)*
Case management visit			
Yes	26 (41)	16 (37)	. . .
No	37 (59)	27 (63)	
Mental health provider visit			
Yes	9 (14)	9 (20)	. . .
No	55 (86)	35 (80)	
Alcohol or drug treatment			
Yes	16 (25)	13 (30)	. . .
No	48 (75)	31 (70)	
Depression (Center for Epidemiological Studies Depression Scale score ≥16)			
Yes	51 (81)	34 (79)	. . .
No	12 (19)	9 (21)	

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Human Participant Protection

All study protocols and materials received approval from the Committee on Human Research at the University of California, San Francisco, and the Data Governance Committee of San Francisco General Hospital. In addition, a Certificate of Confidentiality protecting study participants was obtained from the Centers for Disease Control and Prevention.

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TABLE 3—*Continued*

Alcohol abuse (CAGE score ≥ 2)[c]			
Yes	26 (41)	12 (27)	. . .
No	38 (59)	32 (73)	
Marijuana use (nonprescription)			
Yes	42 (66)	15 (34)***	3.63 (1.39, 9.52)**
No	22 (34)	29 (66)	Reference
Crack cocaine use (noninjection)			
Yes	43 (67)	24 (55)	. . .
No	21 (33)	20 (45)	
Methamphetamine use (noninjection)			
Yes	19 (30)	6 (14)*	1.31 (0.40, 4.30)
No	45 (70)	38 (86)	Reference
Injection drug use			
Yes	41 (64)	19 (44)*	3.17 (1.16, 8.67)*
No	23 (36)	24 (56)	Reference

Note. AOR = adjusted odds ratio; CI = confidence interval. Ellipsis indicates that the variable was not entered in multivariate mode.
[a]We used the χ^2 test to assess group differences in HAART use among 108 participants with a history of any antiretroviral use; 4 participants had missing data for antiretroviral use.
[b]Based on logistic regression with simultaneous entry (probability of not using HAART modeled); 2 participants were not included because of missing data on 1 or more variables.
[c]CAGE is a 4-question alcoholism screening instrument whose name is a mnemonic designating an individual who has attempted to "cut down" on alcohol consumption, is "annoyed" by criticism of his or her drinking, feels "guilty," and needs an "eye-opener" drink in the morning. The presence of 2 or more of these characteristics is considered indicative of an alcohol use disorder.
*$P \leq .05$; **$P \leq .01$; ***$P \leq .001$.

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